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PTO/SB/16 (02-01)
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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

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INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	RESIDENCE (City and either State or Foreign Country)
Joseph M. Michael W. Scott C.	Onderko Miller Bly	Stow, Ohio Brunswick, Ohio Parma, Ohio

_____ Additional inventors are being named on the _____ separately numbered sheets attached hereto

TITLE OF THE INVENTION (280 characters max)

OVERRIDE CONTROL CIRCUITS FOR A LAWN AND GARDEN TRACTOR

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ENCLOSED APPLICATION PARTS (*check all that apply*)

- ☒ Specification *Number of Pages* _6_
- ☒ Drawings *Number of Sheets* _2_
- ☐ Application Data Sheet. See 37 CFR 1.76
- ☐ CD(s), Number
- ☐ Other (specify) _____

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- ☐ Applicant claims small entity status. See 37 CFR 1.27
- ☒ A check or money order is enclosed to cover the filing fees
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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

_X_ No

___ Yes, the name of the U.S. Government agency and the Government contract number are:

Respectfully submitted,

Date: 2/20/04

SIGNATURE Bruce E. Peacock

TYPED or PRINTED NAME Bruce E. Peacock

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USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

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Serial No.	Filing Date	Examiner	Group Art Unit

Invention: OVERRIDE CONTROL CIRCUITS FOR A LAWN AND GARDEN TRACTOR

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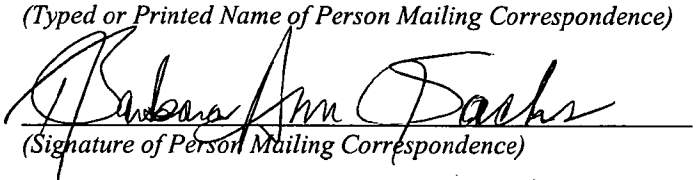

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OVERRIDE CONTROL CIRCUITS FOR A LAWN AND GARDEN TRACTOR

BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to electrical control circuits for a lawn and garden tractor or similar vehicle having a controllable power-take-off (PTO) system, and more particularly relates to an override system for establishing an override condition whereby the operator may operate the PTO while the vehicle is traveling in reverse.

[0002] Lawn and garden tractors or similar vehicles such as snow blowers, sweepers, leaf blowers, etc. with PTO driven attachments are well known. Such a machine generally includes a magneto operated internal combustion (IC) engine for operating the machine and power transfer means for transferring power to an attachment or implement, such as a cutting unit of a lawn and garden tractor or similar vehicle.

[0003] Under certain conditions, it is desirable to operate the PTO while the vehicle is traveling in reverse. Various override systems have been proposed for this purpose, but most are inconvenient or difficult to operate. Providing an override system that is convenient, safe, reliable, and relatively simple to incorporate into existing engine control circuitry has been heretofore difficult to achieve.

SUMMARY OF THE INVENTION

[0004] It is an object of the present invention to provide an improved override control system for a lawn and garden tractor or similar vehicle with a PTO or similar drive. It is another object of the invention to provide selective PTO operation in reverse under limited conditions. It is another object of the invention to provide an override control circuit for such a vehicle with a PTO or similar drive. It is still another object of the invention to provide an override system that is released under limited conditions. It is still another object of the invention to provide such a control circuit which does not require the operator to reset the override system each time reverse operation is selected. It is yet another object of the invention to provide a control circuit which does not require the operator to reset the override system each

time the PTO is returned from the OFF position. It is yet another object of the invention to provide a control circuit which does not require the operator to select a particular key switch position in order to achieve an override condition. It is still yet another object of the invention to provide an override system that is adaptable to both manual and electric PTO systems. It is yet another object of the invention to provide an override system that can be reset under specified conditions.

[0005] These and other objects, features, and advantages of the present invention will become apparent to one skilled in the art upon examination and analysis of the following detailed description in view of the drawings.

DETAILED DESCRIPTION

[0006] Referring to the drawings, wherein like numerals represent like parts throughout, there is generally disclosed a pair of override control circuits. Each circuit may include similar components with similar functions, but appropriate notations detailing important differences between the circuits are included where appropriate. For example, Fig. 1a includes a two pole PTO switch 20 while Fig. 1b includes a three pole PTO switch 20. Such difference between the PTO switches is apparent from the drawings, therefore a detailed discussion regarding such differences may be omitted for convenience if its value is not important. Moreover, with respect to the present invention, it is immaterial whether the key switch 8 is placed in the RUN 1 or RUN 2 position. Accordingly, throughout the following detailed description and/or claims, it is assumed that any reference to the phrase "RUN position" is intended to cover either or both of the RUN 1 and/or RUN 2 key switch positions. .

[0007] Referring to Fig's. 1a and 1b, there is shown a pair of detailed override control circuits for a vehicle such as a riding lawn mower having a conventional magneto operated internal combustion engine (not shown). The circuits incorporate a multi-position key switch 8 with an input terminal 8B connected to a source of electrical power, such as a battery 4. The key switch 8 generally includes an OFF position, a RUN position, and a START position, although an optional RUN position may be included as well as discussed below. As best shown in table 1, when the key switch is in the OFF position, contact is made

between key switch terminals G, M, and A1. When the key switch is in the RUN 2 position, contact is made between key switch terminals B and A1. In the optional RUN 1 position, contact is not only made between key switch terminals B and A1, but an additional contact is made between terminals L and A2. In the present embodiment of the invention, terminals L and A2 are effective to provide power to headlights 108; however, it is understood that a plurality of optional accessories could be powered thereby and that additional key switch positions may also be provided to power additional optional accessories without departing from the scope of the present invention. As mentioned above, key switch positions RUN 1 and RUN 2 may be collectively referred to as the RUN position.

[0008] Referring again to Fig's. 1a and 1b, it is apparent that when the key switch 8 is in the OFF position, an uninterrupted path is provided between the magneto 10 and ground, thereby preventing the engine from operating. When the key switch is in the START position, so long as brake switch 14 is ON and PTO switch 20 is OFF, a complete circuit is provided between starter unit 2 and battery 4. When the key switch 8 is turned to the START position, solenoid 6 is energized by battery 4, thereby actuating starter 2 and starting the engine. Once the engine is started, key switch 8 is moved to either of the RUN positions. In the RUN position, a complete circuit is provided between battery 4 and a regulator terminal (not shown) in a manner known in the art, thereby controlling the regulation of fuel to the engine, allowing the engine to continue to run. Assuming the brake switch 14 is OFF, if the operator leaves the operator seat (thereby disengaging seat switch 12) while the engine is running, an uninterrupted current path is provided between the magneto 10 and ground via seat switch 12, thereby causing the engine to stop running.

[0009] In Fig. 1a, there is shown an override control circuit for controlling a manually actuated PTO. In Fig. 1b, there is shown an override control circuit which includes an electric PTO clutch 60 for controlling an electric PTO. Both circuits include a two-position (eg. ON-OFF) PTO switch 20, shown in the OFF position. The PTO switch 20 is connected to the vehicle's power-take-off (PTO) system in a manner known in the art so that the operator may selectively activate the PTO through the PTO switch.

[0010] As shown in Fig's 1a and 1b, the override control circuits further include a reverse switch 40 and a first general purpose relay 42 associated with the PTO switch 20. As discussed below, under certain conditions, such as when the PTO switch and reverse switch 40 are ON and when first relay 42 is deactivated (as shown), PTO operation will be disabled.

[0011] In the circuit of Fig. 1a, the PTO is disabled under the above conditions because the magneto 10 is grounded via reverse switch 40, thereby disabling the engine and PTO. In the circuit of Fig. 1b, these same conditions are effective to energize second general purpose relay 64, thereby interrupting current through the PTO clutch 60 and disabling the PTO.

[0012] Referring again to Fig's 1a and 1b, both circuits include an override switch 80 for selectively activating an override condition which is effective to permit PTO operation when the vehicle is traveling in reverse, as explained in more detail below.

[0013] Referring now to Fig. 1a, as mentioned above, if the PTO switch 20 and reverse switch 40 are ON, and if first relay 42 is deactivated (as shown), then an uninterrupted current path is provided between the magneto 10 and ground via first relay 42 and reverse switch 40, thereby killing the engine and disabling the PTO.

[0014] However, unlike the manual PTO circuit of Fig. 1a, the electric PTO circuit of Fig. 1b further includes a second general purpose relay 64 and an electric PTO clutch 60 associated with the PTO switch 20. Here, if the PTO switch and reverse switch 40 are ON, and if first relay 42 is deactivated (as shown), then a closed path is provided between an on-board power source, for example, alternator 66, and ground, allowing the flow of current to energize second relay 64, thereby interrupting power to the electric PTO clutch 60 and consequently disabling the PTO. If the operator subsequently moves out of reverse (i.e. reverse switch 40 is OFF), second relay 64 returns to its original position (as shown), allowing PTO operation. As shown in Fig. 1b, the electric PTO circuit further includes an array of electrical leads 107 which may be connected in a manner known in the art to a series of dashboard lights or monitors to notify the operator of the operational status of the respective components as shown.

[0015] Referring again to Figs. 1a and 1b, both circuits include an override switch 80, which may be for example a manually operated twist-and-pull magnetic switch. The override switch 80 is associated with an electromagnetic coil 81. As shown in Fig's 1a and 1b, the coil 81 is powered by an on-board power supply, for example power supplied via key switch terminal A1. In this way, assuming the engine is running and the operator is present on the operator seat 12, the electromagnetic coil 81 is continuously energized via power supplied at key switch terminal A1.

[0016] Accordingly, if the operator desires to operate the PTO while the vehicle is traveling in reverse, the operator must first activate the override switch 80 before reverse operation is selected. Once the operator physically activates the override switch, electromagnetic forces induced by coil 81 are sufficient to maintain the override switch 80 in the ON (closed) position. As a result, a closed path is provided via override switch 80 allowing a flow of current to energize first general purpose relay 42, thereby isolating reverse switch 40 from PTO switch 20 and permitting the operator to repeatedly open and close the reverse switch 40 without interrupting the continuous operation of the PTO. In other words, once the operator activates the override switch, the override switch is maintained in the closed position by the electromagnetic coil 81, allowing the operator to release the override switch without disabling the override condition. In this way, there is no requirement for the operator to actuate the override condition each time the vehicle is put into reverse in order to facilitate mowing in reverse. Once the override switch is engaged and the override condition is achieved, the vehicle can be repeatedly shifted back and forth through FORWARD, NEUTRAL and REVERSE positions while the PTO is ON, without disabling the PTO. Accordingly, once the override switch is activated and the override condition is achieved, the vehicle can be placed in reverse with the PTO ON without having to reactivate the override switch each time the vehicle is placed in reverse. Furthermore, the override condition of the present invention is independent of the status of the PTO switch which means that once the override switch is activated, the operator can repeatedly cycle the PTO switch between the ON and OFF positions without affecting or interrupting the override condition. In this way, additional operator convenience is provided because if the operator desires

to temporarily turn the PTO OFF while in the override position, PTO operation can be subsequently restored by turning the PTO switch ON, without having to re-set or reactivate the override condition.

[0017] If the operator desires to release or disengage the override condition during operation, the operator may manually de-activate the override switch 80 by physically returning the override switch to its original position. This means that the operator must supply sufficient manual or physical force on the override switch (for example by pushing or pulling the twist-and-pull switch) to overcome the opposing magnetic force induced on the switch from the electromagnetic coil 81. Once this is achieved, the override switch (which may, for example, be spring loaded) returns to its original OFF position, thereby interrupting the flow of current to first relay 42 and releasing the override condition.

[0018] Alternatively, if the operator leaves the operator seat while in the override condition, an open circuit is provided between the coil 81 and ground via seat switch 12, thereby releasing the override switch 80 from its ON position and subsequently de-energizing first relay 42 and releasing the override condition.

[0019] Similarly, if the operator turns the vehicle OFF by moving the key switch 8 to the OFF position, the source of power energizing coil 81 via key switch A1 is removed, thereby de-energizing coil 81 and disabling the override condition as discussed above.

[0020] In this way, the operator can manually set and release the override condition by physically activating or deactivating a single override switch 80. Such a simple system provides considerable operator convenience and improved operator safety by allowing the operator to maintain at least one hand on the vehicle's steering control while the operator activates or deactivates the PTO override system.

[0021] In the foregoing specification, the invention has been described with reference to specific exemplary embodiments thereof. It will, however, be evident that various modifications and changes may be made thereunto without departing from the broader spirit and scope of the invention therein.

Fig. 1a

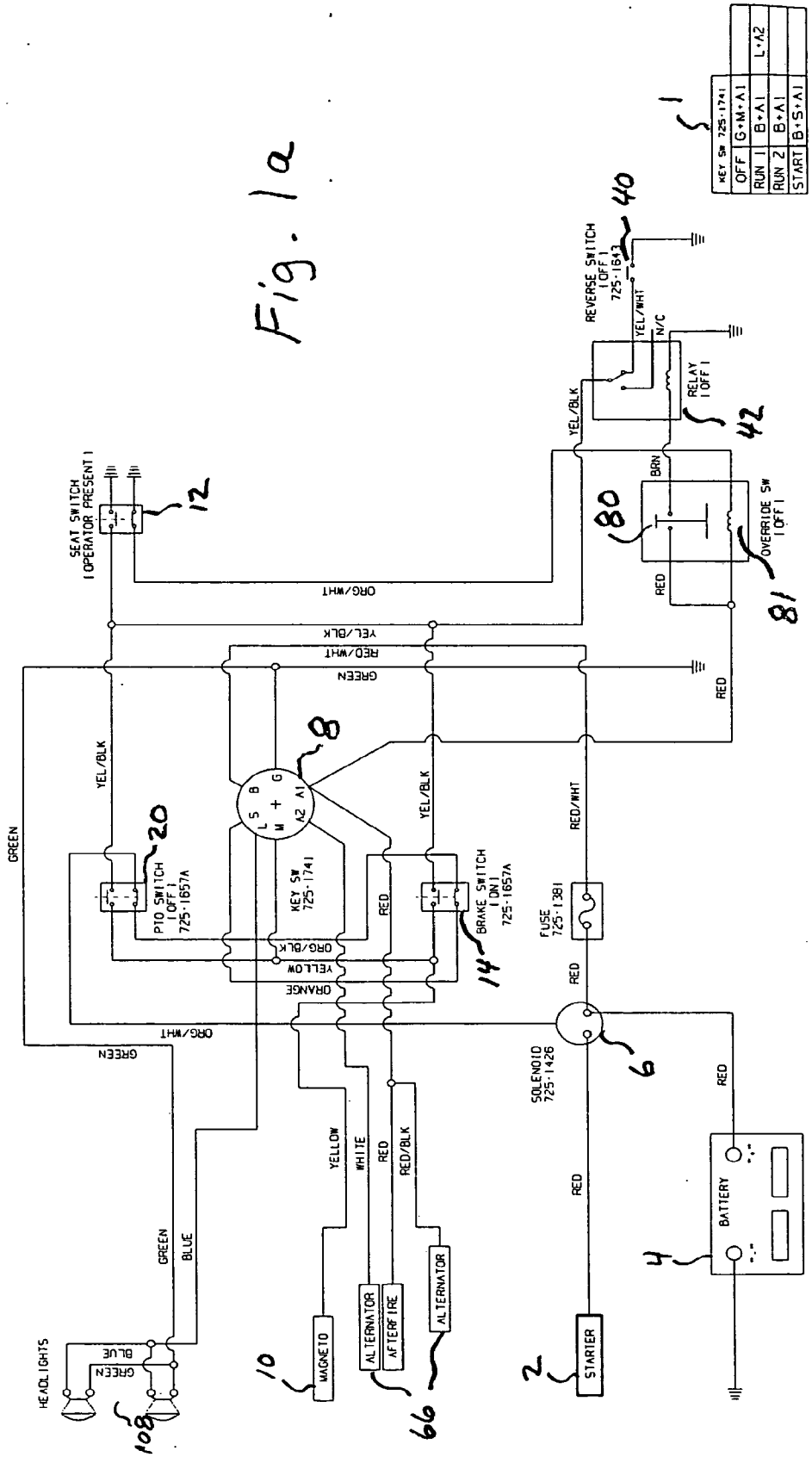
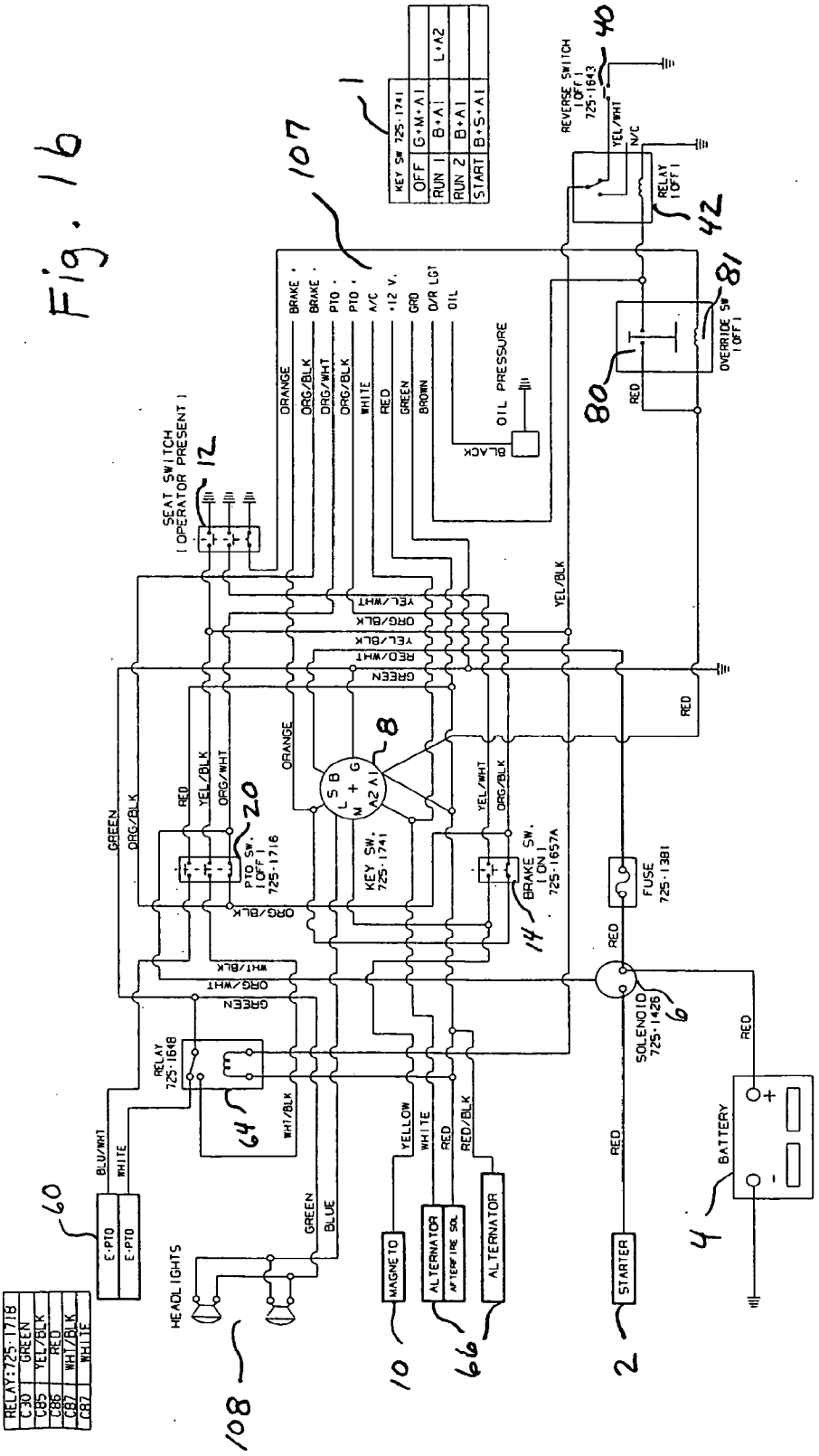

KEY SW 725-1741
OFF
RUN 1
RUN 2
START
G+M+A1
B+A1
B+A1
B+S+A1
L+A2
1
REVERSE SWITCH (OFF) 725-1543
40
YEL/WHT
N/C
RELAY (OFF)
42
YEL/BLK
BRN
80
OVERRIDE SW (OFF)
81
RED
SEAT SWITCH (OPERATOR PRESENT)
12
ORG/WHT
YEL/BLK
RED/WHT
GREEN
8
L S B
M + G
A2 A1
KEY SW 725-1741
20
PTO SWITCH (OFF) 725-1657A
ORG/BLK
YELLOW
ORANGE
RED
BRAKE SWITCH (ON) 725-1657A
14
FUSE 725-1381
RED/WHT
SOLENOID 725-1426
9
RED
BATTERY
4
STARTER
2
ALTERNATOR
AFTERFIRE
ALTERNATOR
66
MAGNETO
10
YELLOW
WHITE
RED
RED/BLK
HEADLIGHTS
GREEN
BLUE
108

Fig. 16


KEY SW 725-1741
OFF
RUN 1
RUN 2
START
G+M+A1
B+A1
B+A1
B+S+A1
L+A2
REVERSE SWITCH (OFF) 725-1643
YEL/WHT
N/C
RELAY (OFF)
OVERRIDE SW (OFF) 725-1716
SEAT SWITCH (OPERATOR PRESENT)
OIL PRESSURE
BLACK
ORANGE
BRAKE
ORG/BLK
PTO
ORG/WHT
A/C
WHITE
+12 V.
RED
GRD
GREEN
D/R LGT
BROWN
OIL
YEL/WHT
YEL/BLK
RED/WHT
PTO SW. (OFF) 725-1716
KEY SW. 725-1741
BRAKE SW. (ON) 725-1657A
FUSE 725-1381
SOLENOID 725-1426
BATTERY
STARTER
ALTERNATOR
MAGNETO
HEADLIGHTS
RELAY 725-1648
WHT/BLK
YELLOW
RED/BLK
BLUE
BLU/WHT
E-PTO
RELAY:725-1718
C30 GREEN
C85 YEL/BLK
C86 RED
C87 WHT/BLK
C87 WHITE
1
107
40
42
81
80
12
20
8
14
6
4
60
108
10
66
2